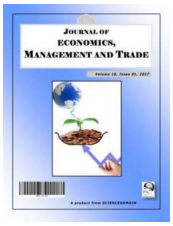

Journal of Economics, Management and Trade

18(2): 1-7, 2017; Article no.JEMT.34092
Previously known as British Journal of Economics, Management & Trade
ISSN: 2278-098X

Impact of Off-farm Sector Involvement on Welfare of Rural Households in Nigeria: A Propensity Score Matching Approach

M. K. Ibrahim[1*], S. O. Adejoh[1] and U. M. Shaibu[1]

[1]Department of Agricultural Economics and Extension, Kogi State University, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author MKI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MKI and SOA managed the analyses of the study. Author UMS managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/*JEMT*/2017/34092
Editor(s):
(1) Chiang-Ming Chen, Department of Economics, National Chi Nan University, Taiwan.
Reviewers:
(1) Zainab Usman, Szent Istvan University, Hungary.
(2) Randa El Bedawy, Misr International University, Egypt.
Complete Peer review History: http://www.sciencedomain.org/review-history/19859

Original Research Article

Received 12th May 2017
Accepted 1st June 2017
Published 4th July 2017

ABSTRACT

This study investigated the impact of off-farm employment on the welfare of households in rural Nigeria employing household data obtained from the RIGA database. A sample of 14,512 rural households was used for the study. Propensity Score Matching (PSM) method was employed to evaluate the impact of participating in both wage and self-employment on the welfare of rural households whose major occupation is farming. Results from analysing socio-economic characteristics showed that majority of the rural households in Nigeria were male headed. These households had very little access to credit especially from formal institutions. Also, most of the households owned land the land they cultivated. The results from the PSM estimations showed that off-farm employment had a positive and robust effect on farm household income. Off-farm participants were observed to have greater consumption expenditure than the non-participating rural households. On average, a rural households involved in off-farm was 8,583 Nigerian naira better-off than a non-participating household. The study therefore recommends relevant policies that will have direct bearing on the rural off-farm sector by enhancing market integration and stimulating the growth of the off-farm sector.

**Corresponding author: E-mail: Ibrahim.mk@ksu.edu.ng;*

Keywords: Enterprise; expenditure; livelihood; rural development and farm households.

1. INTRODUCTION

In Nigeria, the agricultural sector which used to be the major contributor to the country's Gross Domestic Product (GDP) switched roles with the crude oil sector since the discovery and exploration of oil began in 1958 because of over dependence on revenues from the oil sector ([1]. Consequently, the contribution of agriculture which was over 60 percent of the country's total GDP in the 1960s progressively declined to 48.8 percent in the 1970s and 30.8 percent in the 1980s. The sector's contribution was estimated at about 39 percent in 1990 and further dropped to 35.7 percent in 2000 [2]. As reported by the National Bureau of Statistics, the sector's contribution to the real GDP stood at 20.48 percent in 2016 [2,3]. This has however, not in any way undermined the critical role the agricultural sector play in the economy in rural Nigeria which remains principally agrarian. However, the high incidence of off-farm work by rural households and the dwindling share of income from agriculture suggest that agricultural development alone may not be a reliable pathway out of poverty in rural areas [4].

Evidence from developing countries points towards the growing importance of the rural off farm sector [5,6,7]. Rural households view the sector as an avenue to diversify their incomes throughout the year. Hence, the rural off-farm sector has become an important livelihood option for a significant proportion of the rural population accounting for as much as 35-50 percent of the total income of rural households in developing countries [8,9,4]. There is, therefore, a growing awareness that rural households' livelihoods are derived from diverse sources and are not as overwhelmingly dependent on agriculture as previously assumed [10,11,12,13]. The role of the sector as an alternative livelihood avenue for rural households and its contribution to the development of the agricultural sector (through the provision of processing, marketing, and financial services) capable of stimulating and accelerating agricultural growth is well documented [7].

The off-farm sector is highly heterogeneous in terms of the activities that make up the sector. The implication is that there are different magnitude of returns from participating in the activities which range from the highly lucrative to low earning activities. A significant number of previous studies on off-farm labour supply have concluded that the effect of the sector on the welfare of participants is largely a function of the kind of off-farm sector activity undertaken. Therefore, if the rural poor have equal access to participate in high return of off-farm activity, then its impact on reducing rural poverty and income inequality will be remarkable. If however the poor are constrained from participating in those kinds of off-farm activities due to their low stock of resources and human capital, then expansion in the activities of the off-farm sector may imply an increase in poverty and income inequality [14,15]. For example, Davis et al. [15] reported that the impact of rural non-farm activities on poverty and inequality depend on the access of the poor to rural non-farm activities, the potential returns from the activities and its share in total income. Therefore, off-farm diversification might lead to economic prosperity or increases in inequality depending on the type of diversification activity that the households pursue.

The rural off-farm sector in Nigeria is complex and characterized by diverse activities, whose labour and other resource requirements and returns are in no way homogeneous [5]. Rural households may be incapable of maximising the opportunities in the off-farm sector due to personal and institutional constraints like low education levels, high transaction cost and limited access to labour market information [9, 16]. In addition, the presence of entry barriers in the labour market creates difficulty for poor households to maximize the opportunities in the off-farm sector as compared to the non-poor households who have the means to surmount such barriers.

There is significant evidence in the literature on the effect of off-farm sector employment on rural household welfare with considerable variations in the findings. A number of previous studies reported that income obtained from off-farm sector participation contributes to improving the welfare of households and reducing income inequality [6,7,17,18,19]. Other studies have concluded that income from the off-farm sector actually increases income inequality [20,21,22]. The differences observed in the outcomes of the different studies are possibly attributable to the differences in method employed in the aggregation of different off-farm sector activities with varying returns to labour, the type of household data employed and the definition of what constitutes the rural off-farm sector [23,24].

This study is aimed at examining the welfare effects of participation in off-farm activities by households in rural Nigeria. Off-farm sector activities undertaken by households are disaggregated here to account for the heterogeneity of the rural off-farm sector. This is pertinent as the key to understanding the link between the rural non-agricultural sector and rural welfare is based on the heterogeneity of the sector [5]. It is assumed that rural households have differential access to the various activities in the rural off-farm sector with varying rate of returns, hence the need to pay attention to the differences in the effect of alternative off-farm employment opportunities.

2. MATERIALS AND METHODS

The data used in this study was obtained from the Rural Income Generating Activities (RIGA) database of the Food and Agriculture Organization. The database is constructed from a pool of several Living Standard Measurement Surveys (LSMS) and other household surveys which have been made available by the World Bank and national agencies to the FAO. Nigeria is among African countries selected in constructing the RIGA database project alongside Ghana and Malawi. In the case of Nigeria, the RIGA project used the 2003/2004 Nigerian Living Standard Survey (NLSS) data. The data was collected between September, 2003 and August, 2004 with the aid of the National Bureau of Statistics (NBS). Data obtained for Nigeria comprised of 14,512 rural households and 4,646 urban households, however only the rural sample comprising 14,512 households was employed for the analysis in this study.

2.1 Data Analysis

The propensity score matching technique was employed here to determine the impact of off-farm work on welfare of rural households. Suppose the expenditure of an off-farm participating household is Y_{i1}, and say the pre-entry expenditure of the same household is Y_{i0}, and D_i = (0, 1) represents participation status. Then the gain from participation in the off-farm sector is given by:

$$\Delta_i = Y_{i1} - Y_{i0} \quad (1)$$

where Δ_i denotes the welfare impact of off-farm sector participation.

However, while Y_{i1} is observable, Y_{i0} is not. The score matching technique is therefore aimed at trying to obtain an estimate of this missing information. The focus is therefore on the average effect in the population rather than Δi, the effect of participation for any off-farm participant [25]. It becomes possible to estimate Y_{i0} in equation 1 from the sub-sample of nonparticipants in the population, and obtain an estimate of the average effect of off-farm participation as:

$$\Delta_e = E\left(\frac{Y_{i1}}{D_i} = 1\right) - E\left(\frac{Y_{i0}}{D_i} = 0\right) \quad (2)$$

The above matching technique is based on the propensity scores. Propensity score involves estimating the probability of participating in the off-farm sector conditional on the pre-treatment characteristics, *X*. Obtaining a single-index variable (the propensity score) to make the matching feasible is given by:

$$p(Xi) = Pr(Di = 1/Xi) \quad (3)$$

In this study, the propensity score was estimated using a standard probit model with the binary dependent variable representing the two alternatives that are being compared. Having obtained the propensity scores, participants and non-participants with similar propensity scores were matched employing matching estimators: nearest neighbour, kernel, and radius matching. Finally, the difference in expenditure between the matched participants and non-participants is summed over all the differences to obtain the Δ^e shown in equation 2. Three treatment effects were estimated to show the effect of off-farm sector participation on welfare of rural households: Average Treatment Effect on the Treated (ATT), the Average Treatment Effect (ATE) and the Average Treatment Effect on the Untreated (ATU). These treatment effects are computed following [26] as:

$$ATT = E\left[E(YI \mid D = 1) - E(Y0 \mid D = 0) \mid D = 1\right] \quad (4)$$

ATT denotes the effect of participation in the off-farm sector on the expenditure profile of off-farm sector participating households.

$$ATU = E\left[E(YI \mid D = 1) - E(Y0 \mid D = 0) \mid D = 0\right] \quad (5)$$

ATU implies the potential welfare gains for rural households not involved in off-farm work if they were to undertake off-farm work.

$$ATE = E\,[E(YI \mid D = 1) - E(Y0 \mid D = 0)] \quad (6)$$

ATE measures the average effect of off-farm sector participation outcome on a household randomly selected from the rural population.

3. RESULTS AND DISCUSSION

3.1 Socio-demographic Characteristics of Rural Households

Descriptive analysis of selected socio-demographic characteristics of rural households is presented in Table 1. It is evident from the results that majority of the households in rural Nigeria (86.6 percent) are male headed with female headed households making up just about 13.4 percent of the sample. Most of the households (69 percent) have not been successful in accessing any form of credit and only 11.2 percent have had access to credit facilities regularly. The major source of this credit is from public financial institutions which generally put in place stringent conditions rural households must fulfill to access credit. Most of the households fail to meet such requirements based on their poverty status. A significant proportion of the rural households (50.2 percent) had access to land which is available for both farm and off-farm activities. The land tenure system which is still quite traditional provides the opportunity for households to own and operate land passed down as heritage. However a good number of these households (48.9 percent) have for reasons of poverty leased or sold out their lands leaving them landless. In the case of access to electricity, it is evident that only 17.9 percent of rural households reported having electricity supply as against a significant 82.1 percent who are without electricity. The issue of electricity in the study area has been a huge challenge spanning over several years and various attempts by successive government through the power sector road maps have produced little results with majority of households even in the urban centres without power. Despite the huge resources that Nigeria is been blessed with, poverty especially in the rural areas has been on the rise. This has been attributed to huge corruption and mismanagement by the political class. The self assessment by the households of their poverty status further confirms the degree of poverty in the area. Over half of the rural households (52.1 per cent) reported that they are very poor with another 29.5 per cent claiming they are “averagely” poor. Only 18.3 per cent of the households submitted that they were not poor. This result however only reflects self assessment. This is possibly quite close to the situation on the ground, which may be worse than what is revealed here.

Table 1. Distribution Based on Descriptive Statistics of the Selected Sample

Characteristics	Percentage
Gender of household head	
Male	86.6
Female	13.4
Credit access outside home	
Never	69.0
Sometimes	9.5
Always	11.2
Land ownership	
Own land	50.2
Landless	49.8
Access to electricity	
Yes	82.1
No	17.9
Self assessment of poverty	
Very poor	52.1
Averagely poor	29.5
Not poor	18.3

Source: Authors’ computation (2017)

3.2 Welfare Implication of Off-farm Sector Involvement

The result of the probit model employed in predicting the propensity scores is presented in Table 2. A detailed interpretation of the result is not undertaken since as observed by a number of studies such as Lee [27], the propensity scores are only a means to an end. The scores are used for balancing the observed distribution of the covariates across the treated and control groups preparatory for the computation of the treatment effects. It is obvious from the result that the majority of the variables included in the equation returned signs as expected. As observed by Rosenbaum and Rubin [28], that conditional on the propensity score there would be no systematic pre-treatment difference between the treatment and control groups, it is imperative to examine whether the propensity score passes as an adequate balancing score. A balancing test which involves checking that each value of the propensity score has the same distribution for the treatment and control groups was conducted. The common support condition was imposed for all the propensity score estimates and the balancing property was satisfied at the 1 percent level of significance.

Table 2. Probit estimates of propensity score for off-farm sector participation

Variable	Coefficient	Z-value
Gender	0.311**	1.50
Age	0.109	1.22
Education	0.294***	1.12
Household size	0.309**	2.46
Dependants	-0.411	1.84
Credit	0.308*	1.49
Association	0.147**	1.35
Infrastructure	0.082	1.34
Land cultivated	0.194***	1.13
Agric asset	-1.298***	-2.55
Non-agric asset	-0.109*	-1.21
North east	0.409*	1.63
North west	0.212	1.21
South west	0.197	1.30
South east	0.228*	1.17

*Source: Author's computation (2017). Note: ***, **, and * refer to significance at the 1, 5 and 10 per cent levels, respectively*

With the success of the matching procedure, it is possible to examine the differences in the expenditures between off-farm participating and non-participating households. This difference in expenditure (which is the outcome of the "treatment effects") denotes the effect of off-farm participation. The estimators employed to select the non-participants to act as matches for the participants are nearest-neighbour, radius and kernel matching estimators. The results of the nearest neighbour and radius matching estimators alongside the treatments effects are presented in Table 3. The estimates obtained from the kernel matching were very similar to those from the radius matching, hence the result are not presented here.

The treatment effects of off-farm sector participation with the exception of the slight reduction in the value between the nearest neighbour and radius matching produced consistent estimates. Results of both matching estimators show that participation in the off-farm sector has a significant and positive effect on per adult equivalent expenditure of rural households. The estimates of the ATT shows that off-farm participating households have significantly greater welfare gains, as measured by adult equivalent household expenditures, than rural households not involved in off-farm work. The results reveal that on average, a rural household involved in off-farm work has 8,583 naira per adult equivalent expenditure higher than a non-participating household. In terms of individual off-farm work, rural households involved in off-farm self employment and wage employment activities in comparison to the non-participating households are observed to have greater welfare gains. Specifically, self employed households have an average of 3,480 naira higher adult equivalent expenditure than the non-participants, while the wage employed households had on average 4,222 naira higher expenditure.

The estimates of ATU correspond to the potential welfare outcome for the non-participating rural households if they had undertaken off-farm work. The results shows that on average, the adult equivalent expenditure of rural households not involved in off-farm work would have been higher by 5,383 naira if they had undertaken off-farm work. In other words, the welfare of households involved in farming only would have been significantly enhanced if they had off-farm sector ventures. Similarly, the decision to participate in either self or wage employment activities would have significantly improved the welfare of the non-participants. Similar results are obtained in the case of the ATE, where participation in off-farm sector activities by a household randomly drawn from the rural population is capable of

Table 3. Outcomes of rural households according to off-farm sector involvement

Status	Matching estimator	Effect of participation		
		ATT	ATU	ATE
Off-farm sector participation	NNM	8042.70**	5056.99**	6474.11**
	Radius	9125.22**	5709.29**	7397.94**
Self employment participation	NNM	3121.61***	1102.22**	2094.22**
	Radius	3839.81***	1992.07**	2911.50**
Wage employment participation	NNM	4147.10***	2491.02*	3296.50*
	Radius	4298.76***	2568.99*	3401.21*

*Source: Authors' computation (2017). Note: ***, **, and * refer to significance at the 1, 5 and 10 per cent levels, respectively*

Welfare indicator: household expenditures was divided by the number of equivalent adults in the households, therefore the result as presented implies the difference in expenditure per adult equivalent

raising the expenditure of such household by an average of 6,935 naira. The implication of this result is that participation in off-farm sector activities contributes in raising the expenditure profile of households in rural Nigeria. Based on the kind of off-farm sector activities, participation in self employment and wage employment is observed to increase the expenditure profile of rural households on average by 2,502 naira and 3,348 naira, respectively.

4. CONCLUSION

Results of the propensity score matching confirm that participation in off-farm activities significantly increases the welfare outcome of rural households. The results revealed that off-farm participants were observed to have greater consumption expenditure than the non-participating rural households. On average, a rural households involved in off-farm work had 8,583 naira in terms per adult equivalent expenditure more than a non-participant household. In terms of individual off-farm work, rural households involved in off-farm self and wage employment activities in comparison to the non-participating households are observed to have greater welfare gains. The outcome of this study affirms that the gains that accrue to rural households from the off-farm sector is higher for households involved in off-farm work than those who remain in agriculture alone. This outcome is in line with the findings in a number of previous studies (see for example, [29]). Hence any effort aimed at the development of the rural economy and supporting the rural population to undertake off-farm work will be towards achieving the goal of rural poverty reduction.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ugwu DS, Kanu IO. Effects of agricultural reforms on the agricultural sector in Nigeria. Journal of African Studies and Development. 2012;4(2):51–59.
2. National Bureau of Statistics. Nigeria Gross Domestic Product. Issue 09 (Quarter one); 2016.
3. National Bureau of Statistics. The Nigeria Poverty Profile Report. Federal Republic of Nigeria, Abuja, Nigeria; 2012.
4. Haggblade S, Hazell PB, Reardon T. The rural non-farm economy: Prospects for growth and poverty reduction. World development. 2010;38(10).
5. Lanjouw JO, Lanjouw P. The rural non-farm sector: Issues and evidence from developing countries. Agricultural Economics Journal. 2001;26:1-23.
6. Oseni G, Winters P. Rural non-farm activities and agricultural crop production in Nigeria. Agricultural Economics. 2009; 40(2).
7. Babatunde RO, Qaim M. The role of off-farm income diversification in rural Nigeria: Driving forces and household access. Quarterly Journal of International Agriculture. 2009;48(4):305-320.
8. Islam N. The nonfarm sector and rural development: The review of issues and evidence. Food, Agriculture and the Environment Discussion Papers. IFPRI. 1997;22.
9. Reardon T, Stamoulis K, Balisacan A, Cruz ME, Berdegue J, Banks B. Rural nonfarm income in developing countries. In: FAO, The State of Food and Agriculture. FAO, Rome; 1998.
10. Benjamin D, Reardon T, Stamoulis K, Winters P. Promoting farm/nonfarm linkages for rural development - Case studies from Africa and Latin America. FAO, Rome; 2002.
11. Abdulai A, CroleRees A. Determinants of income diversification amongst rural households in southern Mali. Food Policy 2001;26:437-452.
12. Matshe I, Young T. Off-farm labour allocation decisions in small-scale rural households in Zimbabwe. Agricultural Economics. 2004;30(3).
13. Haggblade S, Hazell PB, Reardon T. Transforming the rural non-farm economy. Johns Hopkins University Press, Baltimore, MD; 2007.
14. Start D. The rise and fall of the rural nonfarm economy: Poverty impacts and policy options. Development Policy Review ODI, London. 2001;19(4).
15. Davis JR. The rural non-farm economy, livelihoods, and their diversification: issues and options. Report for the Natural Resources Institute; 2003.
16. Beyene. Determinants of off-farm participation decisions of farm households in Ethiopia. Agrekon. 2008;47(1).
17. De Janvry A, Sadoulet E. Income strategies among rural households in

Mexico: The role of off-farm activities. World Development. 2001;29(3).
18. Rahut DB. Rural non-farm employment in the lower Himalayas of eastern India: A micro-econometric analysis. Cuvillier Verlag, Gottingen; 2006.
19. Zhu N, Luo X. Non-farm activity and rural income inequality: A case study of two provinces in China. Policy Research Working Paper Series No. 3811. World Bank; 2006.
20. Canagarajah S, Newman C, Bhattamishra R. Non-farm income, gender, and inequality: evidence from rural Ghana and Uganda. Food Policy. 2001;26:4:405-420.
21. Kung JK, Lee YF. So what if there is income inequality? The distributive consequence of nonfarm employment in rural China. Economic Development and Cultural Change. 2001;50(1):19-46.
22. Woldenhanna T, Oskam A. Income diversification and entry barriers: Evidence from the Tigary region of northern Ethiopia. Food Policy. 2001;26:351-365.
23. Dercon S, Krishnan P. Income portfolios in rural Ethiopia and Tanzania: Choices and constraints. Journal of Development Studies. 1996;32(6):850-875.
24. Davis B, Winters P, Carletto G, Covarrubias K, Quinones E, Zezza A, Stamoulis K, Azzarri C, Di Giuseppe S. A cross-country comparison of rural income generating activities. World Development. 2010;38(1):48–63.
25. Heckman J, LaLonde R, Smith J. The economies and econometrics of active labour market programs In: Ashenfelter, O., Card, D. *Handbook of Labour Economics Vol. 3A*. North-Holland, Amsterdam; 1999.
26. Becker SO, Ichino A. Estimation of average treatment effects based on propensity scores. The Stata Journal. 2002;2:358–377.
27. Lee JE. Allocating farm resources between farm and nonfarm uses. Journal of Farm Economics. 1965;47(1):83-92.
28. Rosenbaum PR, Rubin D. The central role of the propensity score in observational studies for causal effects. Biometrika. 1983;70:41-55.
29. Victor O, Awudu A, Seini A. Non-farm work and food security among farm households in Northern Ghana. Food Policy. 2011;36: 108–118.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/19859